

PRE-OPERATIONAL REQUIREMENTS FOR TA-53 EMISSIONS MONITORING EQUIPMENT

Purpose This Air Quality Group procedure describes the steps required to ensure the emissions monitoring equipment at TA-53 exhaust stacks are ready for the facility to begin operations.

Scope This procedure applies to the air monitoring equipment used for emissions measurements at the TA-53 monitored exhaust stacks. Also included are systems used for diffuse emissions measurements from TA-53 buildings.

In this procedure This procedure addresses the following major topics:

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Hazard Control Plan The hazard evaluation associated with this work is documented in the following hazard control plans:

- HCP-ESH-17-Office Work
- HCP-ESH-17-TA53-XA (Experimental Area Access)
- HCP-ESH-17-TA53-MI (Maintenance and Instrumentation)

Signatures

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General information about this procedure

Attachments This procedure has the following attachments:

Number	Attachment Title	No. of pages
1	Pre-Operational Checklists for ES-2 and ES-3	2
2	LANSCE Stack Monitoring Instrumentation	2
3	Sample of Posting Label for Instrument Panel	1

History of revision This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	7/26/1993	New document, issued as MP-7-OP-9-1.01, "Procedure for Calibration of LAMPF Stack Flow Rate and Pressure Monitoring Equipment"
1	6/1/1998	Reformatted under LANSCE-FM document control. Contents revised and expanded to reflect current operations and to cover all pre-operational requirements. Issued as 53FMP-104-10.1
2	2/4/02	Reformatted under ESH-17 document control and work authorization, revised to add chapter <i>Pre-Operational Emissions Projection</i> .

Who requires training to this procedure? The following personnel require training before implementing this procedure:

- Personnel assigned to the LANSCE stack monitoring effort

Training method The training method for this procedure is **on-the-job** training by a previously trained employee and is documented in accordance with the procedure for training (ESH-17-024).

Prerequisites In addition to training to this procedure, the following training is also required prior to performing this procedure:

- TA-53 Site Specific training (required for unescorted TA-53 access)
- TA-53 Limited Access Area training for certain experimental areas
- Radiological worker training as appropriate for different areas
- HCP-ESH-17-TA53-XA (Experimental Area Access)
- HCP-ESH-17-TA53-MI (Maintenance and Instrumentation)

General information, continued

Definitions specific to this procedure

LANL Standards and Calibration Laboratory (S&C Lab): Group ESA-MT (Measurement Technology) maintains the Laboratory's standards and calibration facility, which uses NIST-traceable systems & techniques to verify calibration of electronic and physical measurement devices.

References

The following documents are referenced in this procedure:

- ESH-17-024, "Personnel Training"
 - ESH-17-601, "Collecting and Processing Stack Air Particulate and Vapor Samples from TA-53"
 - ESH-17-603, "Calibrating the High Purity Ge System Used on the Monitored Stacks at TA-53"
 - ESH-17-604, "Performance Testing of the Kanne Air Flow-Through Ion Chambers"
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Note

Actions specified within this procedure, unless preceded with "should" or "may," are to be considered mandatory guidance (i.e., "shall").

Introduction

Monitored Stacks

The monitored stacks at the Los Alamos Neutron Science Center (LANSCE), located at LANL Technical Area 53, are designated TA-53-BLDG-7-ES-2 and TA-53-BLDG-3-ES-3. For simplicity, the stacks are referred to in this procedure as ES-2 and ES-3, respectively.

Required calibrations

To ensure accurate measurement and sampling of radioactive air emissions from the LANSCE stacks, all air monitoring equipment must be in proper working order. Certain devices measuring air flow rate or pressure have been identified as requiring calibration at set frequencies. A list of these instruments and their calibration frequencies appears in Attachment 2.

Critical units are checked for calibration prior to delivery of beam to the beam switchyard or any experimental area. If an instrument's calibration time limit will expire prior to the end of the beam operating period, it must be exchanged for a calibrated instrument prior to this time limit expiration. To minimize the affect on facility operations, the unit should be exchanged during a facilities scheduled maintenance outages.

Other devices are calibrated or performance tested by LANSCE Emissions staff or other appropriate individuals prior to each LANSCE operating cycle and as needed during the cycle. These devices are identified throughout the procedure.

Who performs calibrations & performance tests

Calibrations of flow and pressure monitoring equipment are performed by the LANL Standards and Calibration Laboratory, and are made to National Institute of Standards and Technology (NIST) traceable standards according to the procedures of the calibration facility. The LANL S&C Lab also calibrates the direct current source used by the LANSCE Emissions team, and other applicable equipment.

Calibrations of the gamma detection system are performed by the LANSCE Radioactive Air Emissions Team, to NIST-traceable sources and according to ESH-17 procedures. The Kanne flow-through ionization chamber electronics are performance-tested by the emissions staff, using a calibrated current source (mentioned above).

Introduction, continued

Contamina- tion concerns

Internal contamination may exist on the ventilation and sampling systems. Components which are part of the sampling lines should be checked by ESH-1 for contamination prior to sending them for calibration. Instruments sent for calibration must be properly tagged by health physics. If contamination is found and cannot be removed, check to see if the equipment can be accepted by the calibration facility before transporting the instruments.

Prior to inspecting or testing any components which are part of the ventilation system or sampling systems, discuss potential contamination concerns with health physics personnel. In all cases, when accessing internal components of ventilation systems, gloves should be worn and other protective clothing as advised by ESH-1. Consult with health physics prior to opening any sample lines or ventilation systems; a radiological work permit (RWP) may be required before performing portions of this procedure.

Checklists

To simplify verification that pre-operational requirements have been met, a checklist for each stack appears in Attachment 1. These checklists can be used if desired by staff. Alternatively, most routine items on the checklist are also included in the "Equipment Readiness Checks" documentation, maintained by LANSCE-6.

Flow Measurement Instrumentation

Background To measure flow through the various sampling systems (gas and particulate), a calibrated orifice is used in conjunction with an instrumentation panel. This panel contains a pressure gauge, which monitors pressure drop across the calibrated orifice, and a transducer which converts the pressure drop to an electronic voltage signal, allowing for remote monitoring of the flow. The pressure drop across the orifice is proportional to the flow through the orifice, and therefore proportional to the flow through the sampling system.

The one exception is the tritiated water vapor sampling system, which uses a mass flow meter rather than the orifice and pressure gauge system. The entire mass flow meter system is contained in an instrument panel, and has no calibrated orifice associated with it. Attachment 2 shows the stack monitoring instrumentation and the associated required calibrations.

Instruments to calibrate There should be two sets of each instrument needing calibration; one set is installed in the monitoring systems, and the “spare” set is used for emergency backup. When calibrating instruments, the spare set is sent to the calibration lab, leaving the installed units operating. Upon their return from calibration, the spare set is installed, and the previously installed set becomes the emergency spare set for the coming run cycle.

Note that for convenience, a flow measurement gauge (Magnahelic or Photohelic) is mounted on a panel along with an associated pressure transducer. The gauge will give a display of pressure, while the transducer will provide an electronic voltage signal associated with that same pressure. Mounting these items together simplifies installation and removal.

Calibration Expiration If an instrument’s calibration time limit will expire prior to the end of the beam operating period, it must be exchanged for a calibrated instrument prior to this time limit expiration. To minimize the affect on facility operations, the unit should be exchanged during a facilities scheduled maintenance outages.

Flow Measurement Instrumentation, continued

Steps to perform flow calibrations

To calibrate the flow measurement instruments, perform the following steps:

Step	Action
1	Assemble the spare instruments to be calibrated, which should be stored in the TOFI area (TA-53-3M-M105). The list in Attachment 2 should have all the items needed for a typical run cycle at TA-53. Emissions staff can add instruments to the list or remove them as needed, to support LANSCE operations.
2	Contact TA-53 ESH-1 Health Physics (667-7069) to have the desired items checked for removal to an uncontrolled area. Contamination smears of each item and direct radiation measurements will be taken.
3	Contact the LANL S&C Lab (667-4864) to arrange pickup of items. If so desired, the items can be delivered to the calibration facility; a Q-clearance is required for entrance to S and D lab. If using a private vehicle, a LANL property transport pass for that equipment is required.
4	When the items are returned from the LANL S&C Lab, prepare systems for exchange of the in-place devices with the newly-calibrated units. All units received from the S&C Lab should have a valid calibration sticker, as well as a calibration form accompanying each item (usually sent under separate cover).
5	Prior to turning off or removing any of the in-place systems, notify the LANSCE Central Control Room (CCR, 667-5729) of your intent. Certain signals, such as the stack flow, may be monitored by CCR and the loss of signal upon shutdown may result in evacuation alarms, etc. Notification of the appropriate Building Manager and Area Manager is also useful; contact CCR or the LANSCE-FM office (665-2584) to determine contact information for these individuals.
6	Unplug all power supplies to instruments prior to removal and installation.
7	Remove “old” instruments or instrument panels and install the newly-calibrated ones. As needed, diagram wiring or flow connections to simplify installation of new systems.

Flow Measurement Instrumentation, continued

Step	Action
8	<p>Check the flow readings on the newly-installed components. Note that unless operating parameters change (target flow rate, orifice size, etc.), the readings on the various gauges should stay constant from year-to-year.</p> <p>If a new gauge is installed that reads significantly different under unchanging operations, check the system for anything which could affect the reading. If necessary, return the new gauge to the S&C Lab for re-calibration. Inform the S&C Lab of the gauge's typical operating range, to optimize accuracy of calibration.</p>
9	<p>Leak-test connections by closing the inlet flow control valves on the appropriate sample system pump (if so equipped). The flow on the new gauges should go to zero in this case. This step can be omitted if a complete system leak-check will be performed, or if the system is not equipped with proper valves.</p>
10	<p>Label the instrument panel with the desired flow rate and desired pressure drop reading needed to achieve that flow rate. A sample label is shown in Attachment 3.</p>
11	<p>"Limited-Calibration" or "Out-of-calibration" items. If a unit is returned from the calibration facility with a "Limited Calibration" sticker, verify that the applicable range of operation is within the calibration limits stated on the sticker or calibration form. If the item is "Out of Calibration," then replace the item with a new one, and resubmit for calibration.</p>

Detector Calibrations and Performance Tests

Background Various detectors are used to measure the radioactivity concentrations in the stack effluent, as well as in TA-53 buildings where diffuse (non-point) emissions are of concern. These instruments are calibrated or performance tested in-place by Emissions staff.

Note that a calibration implies using a source that can be traced to national standards, whereas a performance test uses a calibrated source to analyze instrument response.

**Steps to
perform
calibrations**

To calibrate or test performance, use the following steps:

Step	Action
1	<u>Kanne Chamber system testing</u> Kanne chambers are used to determine total levels of radioactive materials in the stack air stream or diffuse source. Using procedure ESH-17-604, performance test each Kanne chamber to be used in the upcoming beam operating cycle.
2	<u>Kanne Chamber background rate determination:</u> When the beam is not operating to the measured area (or before beam operations), calculate the current detected in the Kanne chamber. This current will be the background current and will be subtracted from the measurements during the beam operation cycle. This background level should be verified throughout the beam operating cycle (during outages or when the beam is “off” to monitored areas). For charge-integrating electrometers, divide the charge collected over a long (over 1000 seconds) time interval by the time change. For non-integrating units, simply record an average reading when the beam is off to the monitored area.
3	<u>High-Purity Germanium (HPGe) detector calibration:</u> HPGe detectors are used to differentiate the various radioactive gases in the stack air stream. Using procedure ESH-17-603, calibrate the HPGe detectors on each stack to be monitored in the upcoming beam operations cycle.

Pre-Operational Emissions Projection

Background Procedure ESH-17-610 calls for a pre-operational projection of emissions from each monitored stack at TA-53. This estimate will allow the Rad-NESHAP Project Leader to evaluate programmatic needs of LANSCE operations. Based on this projection, procedure –610 also requires varying levels of reporting and authorization requirements.

Note that elevated emissions levels only typically occur during extended beam delivery (“production beam”) to the 1L Target and to targets on Line A, when sustained beam is delivered to the targets. Tuning beam operations, pulse beam delivery, and low-current operations (less than 10 microamperes) rarely results in measurable emissions above background levels. For these latter scenarios, accurate projections are quite difficult and may not reflect reality. If no “production beam” is anticipated for a given time period, document this fact and skip the projection for that time period.

Also note that projections of emissions only need be done for emissions of gaseous mixed activation products (GMAP). These emissions greatly dominate the off-site dose. Projections of other types of emissions (e.g., vapor activation products) need not be performed, as the data will trend with GMAP emissions. It is assumed that, barring unforeseen situations, air emissions are proportional with beam operations, as measured in microampere-hours. This assumption has been demonstrated in recent years.

Determining planned operations Using the projected operations schedule, determine the operations levels of the ion beam to each target area. This information can be obtained from the LANSCE-6 Beam Delivery web page, or by contacting the LANSCE-6 group office or the LANSCE-DO Director of Operations.

The hours of operation, multiplied by beam current, gives units of microamp-hours (uA-hrs).

For example, if the Line D beam will deliver 100 microamperes (uA) of beam to the 1L target for 30 days (= 720 hours), the beam operations will be:

$$100 \text{ uA} * 720 \text{ hrs} = 72,000 \text{ uA-hrs.}$$

Pre-Operational Emissions Projection, continued

Determining emissions rates

For each stack, determine the rate of emissions in curies per microamp-hour. To do this, first determine the operating configuration(s) from previous year(s) which most closely matches the planned operational scenario.

For these configurations, determine the GMAP emissions from a representative time period. These data are available from past GMAP emissions reports.

For the same time period, determine the level of beam operation (microamp-hours). These data can be obtained from historical reports of particulate & vapor activation products (PVAP), which use microamp-hour data to calculate decay. Alternatively, these data can be obtained from the LANSCE-6 Data Scan Re-Play (DSRP) system. Contact LANSCE-6 for more information on this system.

Divide the curies of GMAP emitted by the beam operations to obtain the emission rate, in curies per microamp-hour. Repeat for each applicable source.

Determine estimated emissions

Multiply the estimated hours of operation (microamp-hours) by the estimated emissions rate (curies per microamp-hour) to obtain the release projection, in curies of GMAP.

This estimate may be modified to reflect estimated beam availability, emissions controls devices, or other parameters.

Determine projected composition

Using the operating configurations from previous year(s) which best matches the planned operational scenarios, determine the relative composition of GMAP.

Multiply these percentages by the total curies from the previous step to determine the isotopic breakdown of the projected emissions.

Determine off-site dose

Using historical average values of dose impact (millirem-per-curie factors), determine the off-site dose to the public from facility operations. Alternatively, the ESH-17 person responsible for dose assessments can perform this step with more accurate data.

Pre-Operational Emissions Projection, continued

Report this estimate

Report the estimate of emissions and resulting off-site dose to the Rad-NESHAP Project Leader, the LANSCE Facility Manager, and the LANSCE-DO Operations Director.

Verification

Throughout the run cycle, verify that the emissions estimate is correct using actual emissions & operations data. If the estimate changes, report the change and new estimate to all above parties ASAP. Likewise, report any unanticipated elevated emissions levels to the Project Leader according to the Rad-NESHAPs Quality Assurance Project Plan.

Other Requirements

Background	In addition to the emissions sampling equipment, other functions need to be performed to prepare for the upcoming run cycle. These typically require coordination with other Laboratory groups.
Stack flow measurements	The Laboratory's service provider (JCNNM) measures the stack flow on a quarterly basis. Ensure that all ventilation configurations anticipated to be used during the operations cycle are measured. The Rad-NESHAP Engineering team can assist with scheduling.
HEPA filter tests	<p>The HEPA filter banks on the ES-2 and ES-3 stacks require testing by ESH-5 prior to beam operation. Certification by ESH-5 is good for 12 months. Coordinate with ESH-5 to schedule testing of the HEPA filters, typically in February of each year. Consult with ESH-1 to determine if the HEPA testing will require a radiological work permit.</p> <p>If a filter bank does not meet ESH-5's HEPA performance measures (99.95% removal), consult with LANSCE Operations (LANSCE-DO, -6, and -7) to determine if the system can be replaced or if beam operations can commence with the existing filtration level.</p>
Sample system leak checks	<p>Presently, leak checks of the sample systems are not required. The sample assemblies are the most likely spots for leaks, and they are leak-tested weekly according to ESH-17-601.</p> <p>Annual sample system leak checks were conducted prior to 1997 with no failures. Changing regulations may require sample system leak checks, and may also require additional hardware to be installed in the systems.</p>
Fan preventive maintenance	Preventive maintenance on the stack exhaust fan, boost fans, and other HVAC units is coordinated by the LANSCE-FM maintenance & operations team. If special fan systems are needed by the Emissions team, coordinate with LANSCE-FM to ensure maintenance is performed prior to beam operations.
Target cell sealing	LANSCE-7 may request assistance or advice on minimizing air movement in and around the various beam target cells in operations (especially when Line A is operational). Sealing these cells minimizes air migration from around the target cells into surrounding work areas, as well as maximizes radioactive decay prior to emission. Coordinate any work with LANSCE-7.
Emissions control systems	If an emissions control system (e.g., delay line) is to be used to control emissions, perform pre-operational checkouts according to applicable procedures.

Records resulting from this procedure

Records

The following records generated as a result of this procedure are to be filed in the LANSCE RAEM Records Room (TA-53, Bldg 3R, room R212).

- Pre-operational Checklist for ES-2 (Attachment 1)
- Pre-operational Checklist for ES-3 (Attachment 1)
- Emissions projections reports and associated calculations.
- Certificates of calibration for instruments calibrated by LANL calibration group

PRE-OPERATIONAL CHECKLIST

ES-3: Prior to sending beam to the switchyard

This form is from ESH-17-615

Required Systems: ES-3 Stack monitoring systems
Switchyard Kanne chamber (diffuse)
Other Kanne chambers (diffuse; as needed)

Pre-Operational Task	Date	Initials
<input type="checkbox"/> ES-3 sampling system gauges within calibration	_____	_____
<input type="checkbox"/> ES-3 5 liter Kanne chamber performance test	_____	_____
<input type="checkbox"/> 5 liter KC background determined _____ pA	_____	_____
<input type="checkbox"/> ES-3 HPGe Calibrated	_____	_____
<input type="checkbox"/> P/VAP sample system leak check _____ cfm	_____	_____
<input type="checkbox"/> Gas sample system leak check _____ cfm	_____	_____
<input type="checkbox"/> Emissions estimate complete & reported	_____	_____
<input type="checkbox"/> HEPA filters checked	_____	_____
<input type="checkbox"/> Stack fan preventative maintenance	_____	_____
<input type="checkbox"/> Boost fans (all) preventive maintenance	_____	_____
<input type="checkbox"/> Switchyard Kanne chamber performance test	_____	_____
<input type="checkbox"/> Other Kanne chamber performance tests (note below)	_____	_____

Comments: _____

Systems Ready for Operations:

LANSCCE Air Emissions Team Member

Date

PRE-OPERATIONAL CHECKLIST

ES-2: Prior to sending beam down Line D

This form is from ESH-17-615

Required Systems: ES-2 Stack monitoring systems
Any diffuse emissions Kanne chambers

Pre-Operational Task	Date	Initials
<input type="checkbox"/> ES-2 sampling system gauges within calibration	_____	_____
<input type="checkbox"/> ES-2 50 liter Kanne chamber performance test	_____	_____
<input type="checkbox"/> 50 liter KC background determined _____ pA	_____	_____
<input type="checkbox"/> ES-2 HPGe Calibrated	_____	_____
<input type="checkbox"/> P/VAP sample system leak check _____ cfm	_____	_____
<input type="checkbox"/> Gas sample system leak check _____ cfm	_____	_____
<input type="checkbox"/> Emissions estimate complete & reported	_____	_____
<input type="checkbox"/> HEPA filters checked	_____	_____
<input type="checkbox"/> Stack fan preventive maintenance	_____	_____
<input type="checkbox"/> AHU-1, -2, and -3 fans preventive maintenance	_____	_____
<input type="checkbox"/> Building 28, HV-2 system preventive maintenance	_____	_____
<input type="checkbox"/> Ring Equipment Bldg KC performance test	_____	_____

Comments: _____

Systems Ready for Operations: _____
LANSCe Air Emissions Team Member Date

LANSCE STACK MONITORING INSTRUMENTATION - ES-3

This form is from ESH-17-615

Monitored Parameter	Instrument	Measures	Desired Value	Desired Readout	Calibrate	Calib Duration	Output
ES-3 Stack Flow	Photohelic 0-0.5" H2O	Pitot Tube pressure	n/a	>0.12 in. H2O	pressure	1 year	gauge readout
	Pressure Transducer	Pitot Tube pressure	n/a	n/a	pressure	1 year	voltage
ES-3 Gas Flow	Magnahelic 0-2" H2O	Pressure across orifice	6 cfm	1.0 ± .05 in. H2O	pressure	1 year	gauge reading
	Pressure Transducer	Pressure across orifice	n/a	n/a	pressure	1 year	voltage
	orifice	Flow	n/a	n/a	flow	5 years	pressure
ES-3 PVAP Flow	Magnahelic 0-0.5" H2O	Pressure Across orifice	2 cfm	0.11 ± .05 in. H2O	pressure	1 year	gauge reading
	Pressure Transducer	Pressure Across orifice	n/a	n/a	pressure	1 year	voltage
	orifice	Flow	n/a	n/a	flow	5 years	pressure
ES-3 Tritium Flow	Mass Flow Meter	Flow thru Tritium loop	100 cc/min	100±10 cc/min	flow	1 year	digital display
ES-3 TOFI Power Supply	12 V power supply	Power to transducers	n/a	n/a	voltage	1 year	voltage
ES-3 PVAP Power Supply	12 V power supply	Power to transducers	n/a	n/a	voltage	1 year	voltage
ES-3 Gas System Vacuum	Vac. Gauge 0-100" H2O	Vacuum in system	~10" H2O	~10" H2O	pressure	1 year	gauge reading
ES-3 PVAP System Vacuum	Vac. Gauge 0-100" H2O	Vacuum in system	~12" H2O	~12" H2O	pressure	1 year	gauge reading
ES-3 East Filter Bank	Magnahelic 0-1" H2O	Pressure across filters	~0.9 in H2O	0.7-1.2" H2O	none	1 year	none
ES-3 West Filter Bank	Magnahelic 0-1" H2O	Pressure across filters	~0.75 in H2O	0.5-1.0" H2O	none	1 year	none
Inline flow thru 5-L Kanne	Magnahelic 0-4" H2O	Pressure across orifice	n/a ~0.85	in H2O	none	None	none
	Orifice	Flow	n/a	n/a	flow	5 years	pressure

NOTE: An entry of "none" means system does not require calibration. Items with an entry of "none" typically indicate duplicate gauges, or cases in which the monitored parameter is not compliance-based.

LANSCE STACK MONITORING INSTRUMENTATION - ES-2

This form is from ESH-17-615

Monitored Parameter	Instrument	Measures	Desired Value	Desired Readout	Calibrate	Calib Duration	Output
ES-2 Stack Flow	Photohelic 0-0.5" H2O	Pitot Tube pressure	n/a	> .16 in H2O	pressure	1 year	Gauge Readout
	Pressure Transducer	Pitot Tube pressure	n/a	n/a	pressure	1 year	Voltage
ES-2 Gas Flow	Magnahelic 0-1" H2O	Pressure across orifice	3 cfm	0.28 ± .05 in. H2O	pressure	1 year	Gauge Reading
	Pressure Transducer	Pressure across orifice	n/a	n/a	pressure	1 year	Voltage
	orifice	Flow	n/a	n/a	flow	5 years	Pressure
ES-2 PVAP Flow	Magnahelic 0-0.5" H2O	Pressure across orifice	2 cfm	0.11 ± .05 in. H2O	pressure	1 year	gauge reading
	Pressure Transducer	Pressure across orifice	n/a	n/a	pressure	1 year	voltage
	orifice	Flow	n/a	n/a	flow	5 years	pressure
ES-2 Tritium Flow	Mass Flow Meter	flow thru tritium loop	100 cc/min	100±10 cc/min	flow	1 year	digital display
ES-2 Power Supply	12 V power supply	power to transducers	n/a	n/a	voltage	1 year	voltage
ES-2 Prefilter Bank	Magnahelic 0-1" H2O	pressure drop across prefilter	N/A	< 0.5 in H2O	Pressure	1 year	gauge reading
ES-2 HEPA Filter Bank	Magnahelic 0-4" H2O	pressure drop across HEPA	< 2.0" H2O	0.5 – 1.5 in H2O	Pressure	1 year	gauge reading
1L Target Cell Negative Pressure	Photohelic (-0.5" to 0.5")	Pressure in 1L Target Cell	N/A	At least 0.10" negative	Pressure	1 year	Gauge reading
	Note: for operational reasons, gauge is plumbed "backwards" with negative pressure to RIGHT of zero						
	Pressure Transducer	Pressure in 1L Target Cell	N/A	N/A	Pressure	None (at this time)	Voltage (0-5 VDC)

OTHER EMISSIONS MONITORING INSTRUMENTATION

Monitored Parameter	Instrument	Measures	Desired Value	Desired Readout	Calibrate	Calib Duration	Output
Electrometer input current	Keithley 260 Current Source	Supplies known current	n/a	n/a	Current	6 months	Current output
TOFI Particulate Filter assembly leak-check	Vac. Gauge 0-100" H2O	leakage into P/VAP filter assemblies	n/a	n/a	Pressure	1 year	Gauge Reading
Delay Line Fan Pressure (Line B tunnel)	Vac. Gauge 0-100" H2O	delay line fan pressure	n/a	n/a	Pressure	1 year (as needed)	Gauge Reading
Each Diffuse Emissions Monitoring system	Magnahelic (various)	Pressure across orifice	6 cfm	various	None	None	Gauge Reading
	orifice	Flow	n/a	n/a	Flow	5 years	Pressure

SAMPLE OF POSTING LABEL FOR INSTRUMENT PANEL

ES-3
PARTICULATE/VAPOR
ACTIVATION PRODUCTS
(P/VAP) SAMPLE LINE

FOR 2 CFM FLOW

SET TO 0.11 ± 0.05 IN. H₂O

Signed: _____

Effective Date: _____